SPECIFICATION

TITLE OF INVENTION

Automatic Stove Top Fire Suppression Module

CROSS-REFERENCE TO RELATED APPLICATION

2,030,468	February 11,1936	Rahlmann	169/26
3,653,443	April 4,1972	Dockery	61/61
3,773,111	November 20,1973	Dunn	196/26
3,824,374	July 16,1974	Mayher	169/65
4,157,526	June 5,1979	Davies	337/415
4,256,181	March 17,1981	Searcy	169/65
4,813,487	March 21,1989	Mikulec	169/26
4,830,116	May 16,1989	Walden	169/65
4,834,188	May 30,1989	Silverman	169/65
5,186,260 A	February 16,1993	Scofield	169/65
5,207,276 A	May 4,1993	Scofield	169/61
5,518,075 A	March 26,2002	Padgett	169/65
6,276,461 B1	August 21,2001	Stager	169/65
6,360,825 B1	May 21,1996	Williams	169/59

STATEMENT REGARDING FEDRALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISK APPENDIX

Not Applicable

BACKGROUND OF INVENTION

Field of the Invention

0001 Apparatus for extinguishing fires in stoves used in food preparation.
Grease fire is one of the main causes of serious structure fires.
The purpose of this invention provides an inexpensive means of protection against grease fires on stovetop and ranges. Existing methods for controlling grease fires are either costly or with little control of the velocity at which the suppression agent contacts the burning grease, causing splashing of the burning media. The "Automatic Stove Top Fire Suppression Module" releases the fire suppression agent in several brief rapid layers resulting in a rapid extinguishing of fire and with sufficient quantity to prevent reignition. This unique delivery system is believed to be the only system that divides the dry fire suppression agent in small portions with multiple pulses controlling the decent and direction of fire suppression agent as the agent is deployed.

Description of Prior Art

0002 Prior art for controlling grease fires on stoves is will noted. Prior arts for controlling grease fires are either expensive, difficult to install, unreliable, unsightly, requires additional storage or causes splashing of the burning grease. Some examples of prior art and the problems that are solved this unique invention is briefly described below.

0003 An example of prior art is disclosed in U.S. Pat. No. 2,030,468 issued to Rahlmann . A cable system requiring attachments of pulleys and weights. Requiring extensive modifications for installation and not practical with today kitchens.

0004 Another example of prior art is disclosed in U.S. Pat. No. 3,653,443 issued to Dockery. A system requiring experienced electrician for installation with several unsightly switches and controls.

0005 Another example of prior art is disclosed in U.S. Pat. No. 3,824,374 issued to Mayher. A system requiring additional storage and modifications of surrounding structure for installation.

0006 Another example of prior art is disclosed in U.S. Pat. No. 4,157,526 issued to Davies. A system of unsightly cables and pulley that is not practical for controlling stove fires and requiring extensive installation cost.

0007 Another example of prior art is disclosed in U.S. Pat. No. 4,256,181 issued to Searcy. This system requires a modification of surrounding cabinets by drilling access holes for hoses and pipes in addition to additions storage requirements for pressure vessel.

0008 Another example of prior art is disclosed in U.S. Pat. No. 4,813,487 issued to Mikulec. This system, although contained under the venting hood, requires several mounting points where attachments must be made. The system also requires custom configurations for different configurations of venting hoods.

0009 Another example of prior art is disclosed in U.S. Pat. No. 4,830,116 issued to Walden. This system requires remote storage of pressure vessel and custom installation of nozzles.

0010 Another example of prior art is disclosed in U.S. Pat. No. 4,834,188 issued to Silverman. This system requires mounting of cables and pulleys, modification of surrounding structure with access hole for piping, and additional storage for pressure vessel.

00011 Another example of prior art is disclosed in U.S. Pat. No. 5,186,260 issued to Scofield. This system requires remote storage of pressure vessel and custom installation wiring and fuse link.

0012 Another example of prior art is disclosed in U.S. Pat. No. 5,207,276 issued to Scofield. This system requires remote storage of pressure vessel and custom installation wiring and fuse link.

0013 Another example of prior art is disclosed in U.S. Pat. No. 5,518,075 issued to Padgett. This is a self-contained system using and explosive device to propel a fire extinguishing powder into the burning pan. The acceleration of the fire extinguishing powder created by the explosive device increases the chances of splashing burning grease onto the surrounding stove area. Control of the direction that the powder is deployed is dependent on the rupture configuration caused by the explosive charge and not consistent.

0014 Another example of prior art is disclosed in U.S. Pat. No. 6,276,461 issued to Stager. This is a self-contained system that is mounted to the venting hood and when a fire is detected the unit swings down and the fire suppression material is force out of an opening by a spring. The spring accelerating the fire suppression material and the possibility of large clusters of fire suppressing material striking the burning grease increases the chances for splashing burning grease onto the stovetop or surrounding area.

0015 Another example of prior art is disclosed in U.S. Pat. No. 6,360,825 issued to Williams. This is a self-contained system that is mounted to the venting hood and when a fire is detected the unit forces a fire suppression media through an opening onto the burning fire. The forcing of a dry media through a reduce opening is unreliable due to the compaction of the dry material. Some compaction always occurs and full deployment of the dry fire suppression media is not achieved.

BRIEF SUMMARY OF THE INVENTION

0016 This invention is designed to be use on a stove or range with burner in line front and rear with a venting hood mounted above the burners. This invention uses magnets for installation and requires no special skill or tools for installation.

0017 This invention stores a dry fire suppression agent above the burner in a sealed enclosure and is automatically dispensed when a fire is detected. This invention detects a grease fire on the stovetop by detecting an elevated temperature associated with a grease fire and releases a fire suppression agent into the burning pan, extinguishing the flames. Three embodiments of a trigger mechanism are disclosed and two embodiments of a foil separator are disclosed. A trigger mechanism retracts a restraining pin releasing the lever and cover. A packet of dry fire suppression agent with a foil separator falls using gravity. The foil separator is folded in a manner that divides the fire suppression agent into smaller portions. As the falling packet descends toward the burner, the foil separator distributes pulses of the dry agent alternately toward the front and rear burner. The action of unfolding the foil slows the decent rate of the dry agent and directs the dry agent in controlled manner covering both the front and rear burners with the dry agent. The dry agent has sufficient quantity causing the grease to cake or solidify preventing reignition.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

0018 This document contains 14 Figures to illustrate the instillation and method of storing and deploying the fire-extinguishing agent.

0019 FIG. 1 perspective a typical stove arrangement with two present inventions installed.

0020 FIG. 2 is a perspective view of present invention and illustrates the first embodiment of the trigger mechanism

0021 FIG. 3 is an exploded view of the components used in the fire extinguisher present invention first embodiment illustrating the first trigger mechanism.

0022 FIG. 4 is an exploded view of the components used in the fire extinguisher present invention second embodiment illustrating the second trigger mechanism.

0023 FIG. 5 is an exploded view of the components used in the fire extinguisher present invention third embodiment illustrating the third trigger mechanism.

0024 FIG. 6 is an exploded view of the components used in the fire extinguisher present invention forth embodiment illustrating a simple melt type fuse link.

0025 FIG. 7 is an exploded view of the components used in the fire extinguisher present invention fifth embodiment illustrating the duel cavity configuration with a simple melt type fuse link for each cavity.

0026 FIG. 8 is an exploded view of the components of the first trigger mechanism.

0027 FIG. 9 is an exploded view of the components of the second trigger mechanism.

0028 FIG. 10 is an exploded view of the components of the third trigger mechanism.

0029 FIG. 11 is a prospective view of foil separator using the cup configuration in the folded position.

0030 FIG. 12 is a prospective view of foil separator using the cup configuration before being loaded with fire suppression agent and folded.

0031 FIG. 13 is a prospective view of foil separator using the tube configuration in the unfolded condition.

0032 FIG. 14 is a perspective view of present invention and illustrates the duel cavity embodiment illustrating the melt type fuse trigger.

DETAILED DESCRIPTION OF THE INVENTION

0033 As illustrated in FIG.**1** this invention **10** mounts to the underside of **11,** a venting hood, above and between the front and rear burners. When a grease fire is detected in pan **12** a dry fire suppression agent is release into to burning pan extinguishing the flames and with sufficient quantity to prevent any reignition. A novel means of releasing a dry fire suppression agent is disclosed in this invention. The dry fire suppression agent is wrapped in alternating folds of foil. When released, gravity pulls the foil and dry fire suppression agent toward the stove and as this combination of materials falls, the unfolding action of the foil divides the total of dry fire suppression agent into several smaller units. As the foil and dry fire suppression agent descends, the energy of this falling mass unfolds the foil guiding and dividing the fire suppression materials in opposite directions, and into smaller units. Short spaces are created between these units traveling toward the front burner and the unit traveling toward the rear burners. As the fire suppression agent continues toward the fire resistance of the air, combined with the updraft created by the fire, breaks up

these smaller units of fire suppression agents into a cloud of fire suppression agents. This cloud settles in the areas of the front and rear burners blanketing the fire with this cloud of fire suppression agent. The fire is quickly extinguished and a sufficient quantity of fire suppression agent is deposited into the burning pan to prevent reignition.

0034 This unique method of deploying the fire suppression agent is achieved by configuring the fire suppression agent and foil in the following manner. The beginning of the foil **6** is attached the bottom of enclosure **1** by pressing the foil over the bosses **31** and secured. The fire suppression agent fills the void created by folds in the foil **6** and is illustrated as the location of fire suppression agent. A graphic representation of 7 is illustrated in FIG 1 being deployed. A thin layer of fire suppression agent **7** is evenly distributed over the bottom surface of enclosure **1**. The loose end of **6** is then folded over the first layer of **7**. This front to back layering of **6** and 7 is continued until the total enclosure is filled with the fire suppression agent **7** and foil **6**, as illustrated by the folded configuration of foil **6** in FIG **3,4, 5, 6,** 7 and **11**. A seal **8** is placed between enclosure **1** and hinged cover **2.** The hinged lever **5** is pressed into its stored position as illustrated in FIG.**2** and the trigger mechanism **3A** is secured to cover **2** in turn securing lever. The lever applies pressure on cover to maintain sealing forces between **1,2** and **8.** The fire suppression material is now sealed from contaminants associated with the cooking and venting hood area of the kitchen.

0035 Four configurations of the trigger mechanism is will be disclosed. The first trigger mechanism **3A** is illustrated in FIG **2, 3,** and **8.** Fig **8** is an exploded view of components that make up the trigger mechanism **3A**. Housing **62** FIG. **8** contains two intersecting guide holes **51** and **52**. The retracting pin **9** and compression spring **66** are placed in hole **52** and retainer **67** is secured in the back of guide hole **52** as illustrated in Fig **8**. Balls **64** and **65** are placed in hole **51**. Bi-metal disk **63** is placed in the cavity of cap **61**. Retracting pin **9** is pushed forward to allow ball **65** to rest against shoulder **54** and surface **53** of **9**. This will allow top housing **61** to rest fully against lower housing **62**. This trigger mechanism can now be attached to cover **2** as illustrated in

FIG. **2** with lever **5** between retracting pin **9** and cover **2**. The bi-metal disk **63** is a convex disk that snaps to a concave condition when temperature rises above its designed set point. Bi-metal disk are commonly used for thermal protecting in electrical devices. A fire in the pan **12** will rapidly cause the disk **63** to rise above this set point. With the disk in the concave condition the balls **64** and **65** is forced into this space and the retracting pin is allowed to pass under ball **65** and move to its fully retracted position. The forces require to restrain the retracting pin **9** could not be achieved by the bi-metal disk directly. A mechanical advantage is cleverly achieved by placing the contact points of the ball **65** at an angle that reduces the forces on the bi-metal disk **63** while retaining sufficient force to displace the balls **64** and **65** when no longer secured by bi-metal disk **63**. To reduce the time require to heat bi-metal disk **63** past its set-point, the disk **63** has been placed facing the heat source, fire in pan **12**. Additionally venting to the backside of the disk has been allowed for by openings cap **61** and the thermal path to the mass of the other components of the system has been reduced. The combination of features disclosed in this paragraph yields a sensor that is activated only when the extreme temperatures of a grease fire is detected and greatly reduces the chances of false activation.

0036 The second trigger mechanism **3B** is illustrated in FIG **4, and 9.** Fig **9** is an exploded view of the vertical trigger mechanism **3B** and illustrates the components. Similarly as in trigger mechanism **3A**, trigger mechanism **3B** uses several common components and the action unique to **3B** will be disclosed. An additional ball **74** was added to achieve greater height and decrease the thermal path to the housing **71.** The bi-metal disk **63** and top housing **61** is replaced by a fusible link **73** and cap **72.** Cap **72** is designed to achieve rapid heating of fusible link. When exposed to the extreme temperatures of a grease fire, fuse **73** melts at its melt point temperature and the balls **74, 64,** and **65** are allowed to move toward the cap **72** displacing the melted fuse. The release action is the same as in **3A** described earlier. Fins located on the cap **72** furnish a larger area for heat to be transfered into cap **72** and to the fuse **73.** The wall sections have been reduced to reduce the thermal path to the mass of the other components. The mechanical advantage achieved through the contact angle of ball, as described in trigger mechanism **3A,** allows the fuse **73** to be reduced in size and also

allows the fuse to reach melt temperature quickly. The melted fuse material is contained within the housing.

0037 The third trigger mechanism **3C** is illustrated in FIG **5**, and **10.** Fig **10** is an exploded view of the third trigger mechanism **3C** and illustrates the components. This configuration is a direct approach to retracting pin **9**. Housing **80** has a guide hole **55** for retracting pin **9,** compression spring **66,** and cap **83.** Fuse **82** is seated in cap **83** and components **9**,**66**, and **82** are held in housing **88** by cap **83**. The spring **66** applies retracting forces to retracting pin **9**. Fuse **82** restrains the movement of the pin **9** until it reaches its melt temperature, at that point, pin **9** displaces the melted material and is fully retracted.

0038 The forth trigger mechanism **3D** is illustrated in FIG **6**,**7**, and **14.** The latch holder is a pinned hinge arrangement. A fuse material in the form of a pin**143** is used as the latch holder of cover **141** to the latch holder of the enclosure **142.** When the fuse is melted, the cover **141** is allowed to fall open releasing the combination of foil **6** and fire suppression agent **7**. The deploying of these components is as described previously. In another embodiment of the latch holder is in the configuration in the form of a flat strip with one of its ends secured to enclosure **142** and its other end secured to the cover **5**.

0039 Having fully disclosed the actions of the four configurations of the trigger mechanisms **3A**, **3B**,and **3C** clamed in this invention, the following action occurs after the retracting pin **9** is fully retracted. Lever **5**, maintaining sealing pressure between the housing **1**, the cover **2**, and the seal **8** is released, compression forces of the seal **8** combined with gravity and the weight of fire suppression agent **7**, forces the said lever **5** and cover **2** to it fully open position. Gravity action on the fire suppression material **7** and foil **6** pulls these components towards the stove **13.** As these components descend, the energy of the falling components unfolds the foil **6** guiding and dividing the fire suppression materials **7** in opposite directions, and divides the fire suppression agent into smaller units. Short spaces are created between this unit traveling toward the front burner and the unit traveling toward the rear

burners. As the fire suppression agent continues toward the fire, resistance of the air combined with the updraft created by the fire, these smaller units of fire suppression agents are feather separated creating a cascade of fine fire suppression agent fragments which quickly extinguishes the fire and a sufficient quantity of fire suppression agent is added to the burning pan to prevent reignition.

0040 Another embodiment of the foil **6** illustrated in Fig **11** and Fig**12** is made up a formed sheet of foil where depressing are form in the foil in an alternating pattern. Depressions **101** would contain the fire suppression material to be dispensed in one direction and depressions **102** would hold fire suppression material to be dispensed in the opposite direction. The foil and fire suppression is folded forming a configuration as illustrated in FIG **11**.

0041 Another embodiment of the foil **6** is illustrated in Fig **13** contain either single or more than one pocket folded into the foil forming a tube. In this embodiment of the invention **10** the invention **10** is placed directly over the pan **12**. The fire suppression agent **7** is placed inside the tube in a thin layer. The foil tube is closed by folding the end foil **123** over the open end of formed tube. This is then folded or rolled along section with agent **121** to a size that fit the inside of closure **1** and section **120** is attached to enclosure **1**. When deployed the tube unrolls. After unrolling the energy of the falling fire suppression agent unfolds the end of the foil depositing the dry fire suppression agent into the burning pan.

0042 An additional feature, illustrated in FIGs **2-6,** that enhances the appeal of this invention is a micro switch **91** and switch cover **90** activated by closing of cover **2** allows for a low voltage interface **15** between this invention and automatic cut-off devices **14**. When activated this switch send a signal to these devices to remove the energy source to the stove. These controls are required for insurance discounts in some areas.

0043 Another embodiment of the invention **10** is made up of a container with two cavities and release triggers as illustrated in FIG **7** and FIG **14**. This duel system

gives additional security with redundant systems for all operations. The operation of this configuration is as described previously.

0044 While the invention has been particularly shown and described with reference to an embodiment thereof, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention.